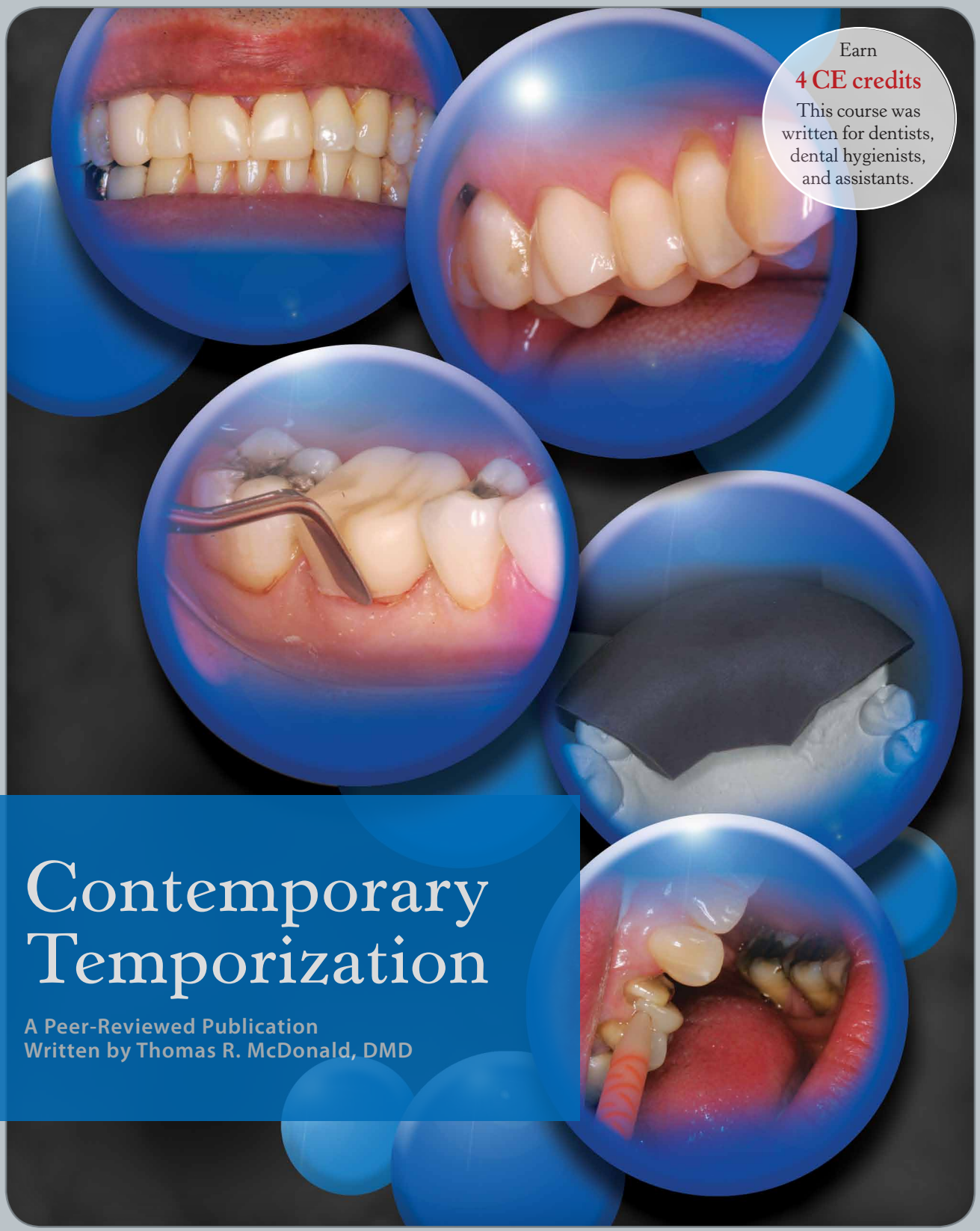

Earn
4 CE credits
This course was written for dentists, dental hygienists, and assistants.

Contemporary Temporization

A Peer-Reviewed Publication
Written by Thomas R. McDonald, DMD

ADA C·E·R·P® | Continuing Education Recognition Program

PennWell is an ADA CERP recognized provider

ADA CERP is a service of the American Dental Association to assist dental professionals in identifying quality providers of continuing dental education. ADA CERP does not approve or endorse individual courses or instructors, nor does it imply acceptance of credit hours by boards of dentistry.

Concerns or complaints about a CE provider may be directed to the provider or to ADA CERP at www.ada.org/goto/cerp.

PennWell®

dental CE digest

ineedce.com
The Academy of Dental Therapeutics and Stomatology®

This course has been made possible through an unrestricted educational grant. The cost of this CE course is $59.00 for 4 CE credits.
Cancellation/Refund Policy: Any participant who is not 100% satisfied with this course can request a full refund by contacting PennWell in writing.

Educational Objectives

This article will review the requirements for temporization and direct and indirect techniques and materials currently available.

Upon completion of this course, the dental professional will be able to:

1. Know the requirements for successful temporization
2. Know the techniques available for indirect temporization and the advantages these offer
3. Know the techniques available for direct temporization and the advantages these offer
4. Know the requirements of temporary cements and considerations required in proper selection.

Abstract

Temporization has become an increasingly common procedure, and may be required short-term or as an interim medium-term step. Excellent provisional restorations are a key component for the clinical success of definitive fixed restorations. Temporization requires consideration of the complexity of the case, length of time the provisional restoration is required, and esthetics. Indirect techniques offer reduced chairside time in comparison to direct techniques. Options for direct temporization have increased in recent years with the introduction of new materials and techniques.

Introduction

Temporization has become an increasingly common procedure as the demand for implants, crowns and bridges, and cosmetic dentistry has increased. More than 35 million crowns were estimated to have been placed by private practitioners in 2007, with fixed partial dentures accounting for more than 10 million additional procedures.[1] Restorative procedures require temporization as an integral component of treatment. Depending on the complexity of the individual case, temporization may be required short-term or as an interim medium-term step to aid in diagnosis, treatment planning and communication with the laboratory.

In advanced restorative and complex esthetic cases, temporization can provide a means to test and refine function, phonetics and esthetics. This information can then be transferred to the laboratory for fabrication of the final restorations. This can yield an increase in patient acceptance and satisfaction.[2,3] Provisionals are also a key component of implant therapy in developing the morphology of peri-implant periodontal tissues.[4] For other cases, the provisional restoration may only be required for two to six weeks while the definitive restoration is being fabricated. Whether required short- or medium-term, and although "temporary," excellent provisional restorations are a key component for the clinical success of definitive fixed restorations.[5]

Considerations for temporization

Temporization materials and techniques require consideration of the complexity of the case, length of time the provisional restoration is required, and esthetics. The ideal provisional restoration is biocompatible, non-irritating, dimensionally stable during and after fabrication/placement, occupies the prepared space to prevent tooth movement and undesired alterations in either the occlusion or position of adjacent teeth, and possesses good marginal adaptation.[6,7] It must be sufficiently strong to resist occlusal and functional loads, and possess good fracture resistance and flexural strength. The provisional restoration must promote healing of the gingivae and potentially enhance development of the gingival form and papillae. It must possess polished, tissue-friendly margins and contours to avoid irritation and to reduce the potential for plaque accumulation and staining.[8] Ideally, it should discourage the development of plaque and attachment of oral bacteria. If margins are rough and inaccurate, iatrogenic gingival recession and damage to the periodontium can occur.[9] An excellent fit is also necessary to help prevent microleakage, which could result in pulpitis and long-term patient discomfort. It must be esthetically pleasing, especially in the anterior esthetic zone. Last but not least, temporization should be as simple and efficient as possible for the clinician – and thereby also more acceptable to the patient who may already have undergone a lengthy appointment. Custom fabrication is required for multi-unit restorations.[10]

Table 1. Ideal properties of provisional restorations

Biocompatible and non-irritating
Dimensionally stable
Resistant to occlusal and functional loads
Resistant to fracture
Possess flexural and compressive strength
Minimal exothermic setting reaction
Promote healing and discourage development of plaque
Possess polished, tissue-friendly margins and contours
Esthetically pleasing
Quick and simple to fabricate

Provisional restoration materials (resins)

Custom fabricated provisional restorations can be fabricated from methacrylate resins (the first materials available), bisphenol-A-glycidyl methacrylate (bis-GMA) or bisacrylate composite (bis-Acryl) materials. Each of the materials used has offered traditional advantages and disadvantages. In certain situations, methacrylates have been fabricated to offer enhanced esthetics over other materials. While for fixed multi-unit provisional restorations strength is a critical consideration, this is less critical for single-unit provisionals. Traditionally, the methacrylates and bis-GMA resins have offered greater strength than the bis-Acryl resins, while flexural strength has been greater with bis-Acryl resins than with methacrylates. One study found this to be product specific, not material specific.[11] Using fine particle sizes also improves the smoothness and ability to polish the cured material. In vitro studies have found temperature changes during exothermic setting of provisional resin materials to be capable of inducing marked pulpal responses.[12] Methacrylates have a higher exothermic setting than bis-Acryl materials which generally offer a lower exother-

mic setting temperature than the methacrylates. One study found methylmethacrylate to have higher exothermic reactions than the ethyl or vinyl methacrylate resins, which were found to be similar to bis-Acryl resins.[13] Bis-Acryl materials also offer lower polymerization shrinkage. Historically, clinicians found the air-inhibited surface layer of bis-Acryl materials and their poor tensile strength objectionable.

Contemporary bis-Acryl

More recently developed materials have improved these characteristics (Protemp™ Plus Temporization Material, 3M ESPE; Versa-Temp, Sultan Chemists; Systemp C+B, Ivoclar-Vivadent; Smart Temp, Parkell). These have enabled increased accuracy and the fabrication of stronger temporary restorations. In addition, advanced fillers and fluorescence have further improved the strength[14] and esthetics of bis-Acryl – polished, glossy restorations are achievable without use of polishing materials or gloss resin finishers (Protemp Plus). A polished, glossy surface can be developed rapidly with Protemp Plus by wiping the provisional restoration with ethanol. This high-gloss finish helps prevent the build-up of plaque on the temporary restoration which is especially important at the gingival margin. A high gloss also helps prevent staining, which was problematic with the early generation provisional restoration materials. The reduced air-inhibited layer found with advanced bis-Acryl is easier to remove and results in a smooth, rather than sticky, feel to the material. A further improvement in recent temporization materials has been the introduction of cartridge-based applicators that eliminate the need for manual mixing or placement of the material using plastic instruments.

Custom-fabricated provisional restoration techniques

Custom-fabricated temporization can involve a direct, indirect or hybrid technique.[15] In each case, a matrix (template or stent) is required to form the restoration.

Indirect technique

If sufficient tooth structure remains prior to preparation and treatment planning casts were made, or if a diagnostic wax-up was performed to determine the appropriate shape and contour of the proposed final restorations, a matrix can be fabricated using a stiff VPS material (Position™ Penta™ Quick, 3M ESPE) or a stiff silicone putty (Express™ Registration, 3M ESPE; SilTec, Ivoclar-Vivadent; Genie, Sultan Chemists) in the laboratory on the stone model or diagnostic wax-up. Following tooth preparation, an alginate or vinyl polysiloxane (VPS) impression is taken of the prepared arch and a stone model is poured. It should be noted that while alginate is less expensive and quicker to use than VPS, it is also more likely to tear during multiple pours, and to distort during storage and laboratory use.

The silicone matrix is filled with the selected provisional material at the site corresponding to the prepared teeth, and is then placed over a stone model poured from an impression of

Figure 1. Diagnostic wax-up

Figure 2. Stone model of preparations

Figure 3. Matrix filled with resin

Figure 4. Matrix on stone model

Figure 5. Finished provisional restoration

the prepared teeth. If a methacrylate material was chosen, it will exhibit greater physical properties if cured in a pressure pot.[16] An alternative is to use a vacu-form matrix instead of silicone putty; however, this is less accurate (especially in the sulcus) and cannot be used over a diagnostic wax-up. After curing is completed, the provisional restorations are removed from the matrix, trimmed, polished and ready for placement. The case shown in Figures 1-5 shows the indirect technique. Note the glossy, polished appearance of the final provisional restoration.

An advantage of this indirect technique is the reduced chairside time. There is no potential for pulpal damage from exothermic setting of provisional materials, and the stone cast limits polymerization shrinkage. Many clinicians prefer fabrication and trimming outside of the operatory. Disadvantages include the requirement for preoperative models and increased laboratory skills. The potential for inaccuracies between casts also exists.

Hybrid technique – indirect/direct

The hybrid technique utilizes a preoperative laboratory-fabricated matrix constructed in the manner described above. It is then delivered to the operatory for chairside fabrication of the restorations. The only difference between the hybrid technique and the direct custom fabrication technique described below is the preoperative, extra-oral, laboratory fabrication of the matrix. With the hybrid technique there is no waiting time for fabrication of provisionals and no impressioning or pouring of casts, reducing a potential source of inaccuracy. However, more chairside time is required for fabrication of the provisionals. Currently, the hybrid technique is the best technique for the fabrication of veneer provisional restorations. With veneers, the restorations are fabricated, finished and polished directly on the prepared teeth.

Figure 6. Silicone putty created on stone model in laboratory

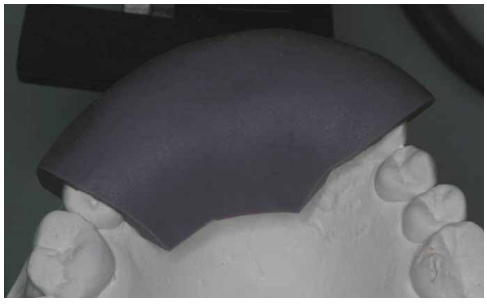

Figure 7. Prepared teeth for fixed restoration

Figure 8. Matrix filled with resin, over preparations

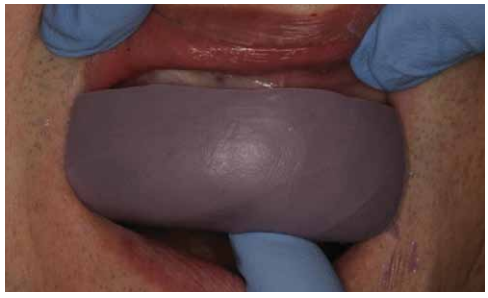

Figure 9. Provisional restoration in position, matrix removed

Figure 10. Final provisional restoration

Direct technique

The direct technique utilizes either a custom impression matrix or a pre-fabricated matrix. In addition, direct custom fabrication using a clear, thin strip crown form (matrix) filled with resin for anterior temporization may work in a limited number of cases.

Impression matrix

An alginate or VPS impression can be used as the custom matrix, taken before the tooth is prepared. This relies upon sufficient tooth structure being present to mimic the desired contours of the provisional restoration, or the tooth being contoured prior to the matrix impression being taken. Following tooth preparation, the matrix is filled with the selected material at the site corresponding to the prepared tooth. Since visible light does not transmit through traditional impression materials, the provisional is fabricated using self-curing resin. As an alternative to traditional impression trays and VPS/alginate impression material, a clear impression tray and clear VPS impression material can be selected (Memosil® 2, Heraeus Kulzer; TempSpan™ Clear Matrix Material, Pentron Clinical Technologies; Clearly Affinity™, Clinician's Choice). This

technique enables the use of light-cured or dual-cured resins (bis-GMA or bis-Acryl) for direct fabrication.

Matrix Button

A pre-fabricated matrix (Matrix Button™, Advantage Dental Products, Inc.) reduces chairside time by removing the need for an additional impression, and is a simple method for chairside fabrication of single-unit provisionals. The button is softened in hot water until it turns clear, indicating that it is soft and malleable and ready for use.[17] It is then kneaded between the fingers and adapted on the unprepared tooth. The matrix must cover at least 3 mm beyond the gingival margin as well as at least one-half of the teeth mesial and distal to the preparation.[18] If the unprepared tooth's contour or existing structure is inadequate, it can be patched with composite before using a matrix button. Try the matrix over the tooth several times after removing it, and to practice the path of insertion - this will save time by avoiding inaccuracies and time-consuming adjustments of the provisional later. After preparation, the adjacent teeth and soft tissue, and internal aspect of the matrix, are lubricated with mineral oil. A small amount of bis-Acryl resin is then placed interproximally mesial and distal to the preparation to help prevent material voids; the matrix is then filled with the resin, and inserted. After placing a cotton roll over the matrix, the patient should bite down firmly until the material has reached its initial cure. This will usually take 30–40 seconds, a test piece can be used to determine when setting has begun. Usually the matrix and provisional will be removed from the mouth simultaneously; if not, the provisional can easily be removed using a plastic instrument (taking care not to damage the margins of the provisional). The provisional is then trimmed, tried, adjusted as necessary, polished and cemented. Methylmethacrylate resin is not compatible with the matrix button.

Figure 11. Heated, clear, malleable matrix button

Figure 12. Mineral oil applied to internal aspect of matrix

Figure 13. Placing bis-Acryl resin mesial and distal (Protemp Plus)

Figure 14. Matrix inserted

Figure 15. Final provisional restoration

Figure 16. Final provisional restoration in different case

Pre-fabricated provisional restorations

Pre-fabricated provisional restorations are available for anterior and posterior teeth. Materials used include polycarbonate, stainless steel and other metals/metal alloys, and most recently composite resin.

Polycarbonate prefabricated provisionals

Provisional restorations constructed of polycarbonate material have been available for several decades in a selection of sizes and shapes for individual central and lateral incisors, canines and

biscupids. They are rigid, preformed plastic shapes that can be trimmed to some extent at the margins using curved scissors or a bur. It can be difficult to achieve acceptable esthetics or contours at the gingival margin using these. Additionally, if the polycarbonate crown was adjusted, achieving clinically acceptable smooth surfaces and margins can also be difficult. Prefabricated polycarbonate crown forms can be cemented into position, or they can first be relined with bis-Acryl resin to provide a better fit to preparation and then trimmed and cemented. Generally, provisional restorations constructed of polycarbonate are more time consuming and less precise than custom-fabricated restorations.

Stainless steel/metal provisionals

Pre-fabricated metal posterior provisional crowns have also been available for several decades. Thin, soft tin-silver alloy provisionals are available that are intended for use only while a definitive crown is being fabricated. These can be stretched and burnished to fit the preparation margins. They are available in a number of sizes, quick to place, and compatible with all available temporary cements. However, the soft nature of the material is also an inherent disadvantage – if care is not taken during the adjustment and placement of the provisional restoration, the patient can easily distort and bite through the material. Prefabricated stainless steel crowns are also available that can be used for longer periods of time. These are very durable and thicker. They are pre-trimmed, belled and crimped to save placement time. If necessary, they can be used for long-term cases when economic considerations are a factor. Metal provisional crowns are esthetically unsatisfactory to most patients, and it can be more difficult to achieve proper contour and contacts than with other techniques.

Methacrylate composite provisionals

A pre-fabricated composite provisional crown (Protemp™ Crown Temporization Material, 3M ESPE) has been introduced that is malleable and adjustable. This allows for the placement of esthetically acceptable prefabricated anatomical crowns for short-term use. The Protemp Crown is available for molars, bicuspids and canines, in a kit containing nine sizes, and is made of light-curable methacrylate composite. The technique for temporization using this option is quick and efficient. After selecting the appropriate temporary crown from measurements of the mesial-distal space, trim the crown following the gingival contour. It is best to trim the crown short rather than leaving it too long. Gently place it on the preparation, and use fingers to ensure that the crown is in line with the adjacent teeth. Ask the patient to slowly and gently bite into occlusion. Adapt the buccal margin using a composite instrument; then tack cure the buccal surface for three seconds. Have the patient open, and adapt the lingual surface and margin. Then tack cure both the lingual and occlusal surfaces for three seconds. After tack cure, remove, then carefully put the crown back in place several times to ensure fit before the final cure. Then fully cure the crown for 60 seconds outside the mouth, making certain all surfaces are light-cured. Remove the oxygen inhibition layer from all surfaces with alcohol. Polish the crown and finish the margins. The provisional crown is then ready for cementation. Since curing of the material is predominantly extra-oral, there is no potential for pulpal irritation due to exothermic setting of the provisional crown resin. No impressions are required for fabrication, reducing the potential for error and improving patient comfort, and the procedure is quickly performed. In vitro testing of the Protemp Crown has found it to have comparable fracture toughness and strength to provisional crowns fabricated using leading provisional resin materials.[19] The malleability of this material has allowed this product to overcome traditional limitations of prefabricated provisional materials.

Figure 17. Prepared tooth

Figure 18. Protemp Crown

Figure 19. Adaptation with plastic instrument

Figure 20. Light-curing the provisional restoration

Figure 21. Trimming the margin

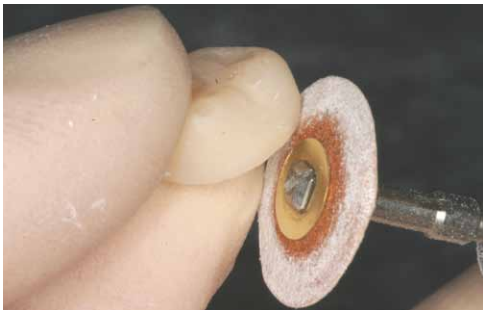

Figure 22. Completed provisional restoration

Finishing and polishing resin provisional restorations

For finishing of resin provisional restorations, diamond and acrylic burs can be used, as well as finishing discs and points (Sof-Lex™, 3M ESPE; Thomas R McDonald DMD Provisional Restorations Kit, Brasseler USA; Astropol Points, Ivoclar-Vivadent). One small in vitro study found that with both bis-Acryl and methacrylate resins, a smoother polish was achieved using a diamond paste (Insta glaze) compared to an aluminum oxide paste (Composite Polish).[20] A separate study found that use of diamond paste after polishing with pumice reduced the propensity for staining for both methacrylate and bis-Acryl resins.[21] Final polishing of provisional restorations can be enhanced using resin glazes or liquid polishing agents. Polymethyl methacrylate crowns coated with either bonding resin or liquid polish have been found to reduce the adsorption of salivary protein and therefore help prevent biofilm formation.[22] Many clinicians, however, have found that polishing with medium pumice on a rag wheel/lathe in the laboratory produces a surface that resists plaque and stain as well as providing a more esthetic surface than glossy resin glazes.[23]

Troubleshooting – adjusting and repairing single-unit provisional resin restorations

Single-unit resin provisional restorations may on occasion present with minor voids upon polymerization, despite use of a careful technique. If voids are major, it is advisable to fabricate a new provisional restoration. For minor voids, or where a minor repair is required in an existing provisional restoration, it is possible to use a simple technique with a composite material to repair methylmethacrylate, bis-GMA and bis-Acryl resin crowns. To do so, the area is first roughened with a diamond bur or air abrasion. If using a regular composite material, an enamel

Table 2. Factors in success: comparison of fabrication techniques

Indirect Technique	Requires pre-treatment impression and cast Reduces chairside time Stone casts reduce polymerization shrinkage No potential for pulpal damage from exothermic setting of resin Esthetic results Increases potential for inaccuracies Increased laboratory requirements Can be used with diagnostic wax-up Suitable for single-unit and multi-unit temporization
Hybrid Technique	Less laboratory time and costs than indirect technique Most suitable technique for veneer temporization
Direct Techniques	
Chairside Fabrication	Increases chairside time Offers option of immediate temporization Good esthetics, depending on material Reduces laboratory costs Pre-treatment cast not required Cannot be used with diagnostic wax-up Exothermic setting reaction with methacrylates
Matrix Button	Reduces chairside time for chairside fabrication No need for impression to develop matrix Easy to use Not compatible with methacrylates
Pre-fabricated	
Polycarbonate crowns	Time consuming Limits fit, shape and contour Poor esthetics May require bis-Acryl or bis-GMA internally Difficult to trim, rough margins For single-unit temporization only
Metal posterior crowns	Minimal chairside time Limits fit, shape and contour Easy to trim Absence of esthetics No exothermic resin setting reaction For single-unit temporization only
Malleable resin crown	Minimal chairside time Reduces exposure to exothermic setting reaction Good esthetics Fit and contour are created chairside Sufficient strength for short- and medium-term use Not available for incisors For single-unit temporization only

bonding agent is placed, followed by the light-cured composite. After shaping of the composite, it is light-cured, finished and polished. Flowable composites (Filtek™ Flow Flowable Restorative, 3M ESPE; EsthetX® Flow, Dentsply Caulk; Gradia® Direct Flow, GC America; Revolution™, Kerr) can be used for provisional crown repairs and are easier to use.[24]

Temporary cements

The ideal temporary cement will be biocompatible, insoluble when exposed to saliva and other fluids intra-orally, provide a hermetic seal, adhere strongly to the provisional restoration, and adhere to the tooth sufficiently for temporization while still being easily removed with the provisional crown when it is time for definitive restoration placement. It should be esthetic, reduce potential sensitivity, offer caries-preventive benefits if for long-term use, be compatible with the provisional material used, have appropriate shade and opacity properties, and not chemically interfere with the permanent cement. All of these factors must be considered when selecting a temporary cement.

Table 3. Ideal temporary cement properties

Biocompatible
Compatible with the provisional material
Insoluble in saliva and other intra-oral fluids
Provide a hermetic seal
Adhere strongly to the provisional restoration
Adhere sufficiently to the tooth
Esthetic
Reduce potential sensitivity
Offer easy removal of the provisional restoration
Compatible with the permanent luting cement
Offer caries-preventive benefits

Available temporary cements include zinc oxide-eugenol, IRM (zinc oxide-eugenol reinforced with methacrylate), polycarboxylate cements and zinc phosphate cements.[25] Calcium hydroxide is weak and unsuitable as a temporary or permanent luting cement, while the glass ionomer cements can be too strong for use as temporary cements. Zinc phosphate and polycarboxylate cements are also strong, and are not typically the cement of choice for a provisional restoration (although for medium-term use they can be suitable). A further disadvantage of zinc phosphate cement is its acidity upon placement and prior to setting, which can result in pulpal irritation and sensitivity.

Varnishes can be used prior to the application of luting cements to help provide a seal and reduce adhesion to the preparation when using very strong cements. Chlorhexidine acetate is often added as an antibacterial agent. Two coats of Copalite (Cooley and Cooley) will do this, while other studies have found the use of 5% sodium fluoride varnish helpful.[26] Any final polycarboxylate, glass ionomer, resin or zinc phosphate cement can be used for provisionalization if a varnish is applied prior to cementation. It is important if using additional products such as varnishes to check with the manufacturer that the varnish is compatible with the selected luting cement and will not reduce retention or interfere with setting. Varnishes can be removed with careful air abrasion or pumice prior to final cementation.

TempAdvantage™ (GC America) is an auto-curing, auto-mixed eugenol-free temporary cement that contains fluoride, chlorhexidine and potassium nitrate. It is antibacterial, formulated to help reduce sensitivity, and easily removed when final restoration placement takes place. As with polycarboxylate cement, its opacity is a drawback. Newer materials include the use of composite-based temporary cements. Dual-curing, auto-mixed composite-based temporary cement is also available (Systemp.link, Ivoclar; TempBond® Clear, Kerr), and offers translucency for esthetics and compatibility with provisional restoration materials. Most resin-based cements do not contain antibacterial elements. However, TempBond Clear does contain triclosan.

Eugenol has a long history of use. It has been found in some studies to impair the bonding of both self-etch and etch-and-rinse adhesive bonding systems used for definitive restoration cementation, with a recent study finding this effect more pronounced with the self-etch system.[27] Other studies, however, have found no impairment with the use of eugenol and subsequent cementation with self-etch adhesives,[28] or with self-etch primers and total etch systems.[29] With the increased popularity of resin bonding of final restorations, many clinicians are avoiding eugenol-based provisional cements. Polycarboxylate cement (Durelon™, 3M ESPE) does not interact with bonding system luting cements or other permanent cements, offers adequate retention, is nonirritant compared to zinc phosphate, has a long history of use, and is easy to use. However, it has a short working time for placement as well as removal of excess cement, and is white and opaque – a disadvantage for thin provisional restorations in the esthetic zone. The adhesion of Durelon to the tooth preparation has caused some clinicians to avoid its use unless they first place a sealer as indicated above. Non-eugenol temporary luting cements include RelyX™ NE (3M ESPE) and TempBond® NE (Kerr).

Summary

Temporization may be required short-term or as an interim medium-term step, depending on the complexity of the individual case. Excellent provisional restorations are a key component for the clinical success of definitive fixed restorations, and considerations include the length of time the provisional restoration is required, esthetics, chairside time and patient and clinician preferences. Indirect techniques offer reduced chairside time in general in comparison to direct techniques. Options for direct temporization have increased in recent years with the introduction of new materials and techniques, including pre-fabricated matrices, as well as stronger and more esthetic resins and malleable pre-fabricated resin crowns that enable use of a simple temporization technique for esthetically-acceptable temporization.

References

1 iData Research, Inc. U.S. Market for Dental Prosthetic Devices, 2007.
2 McDonald TR. Esthetic and Functional Testing with Provisional Restorations. The Art of Articulation. 2004;2(1):1-3.
3 Gratton DG, Aquilino SA. Interim restorations. Dent Clin North Am. 2004;48(2):vii, 487-97.
4 Conte GJ, Fagan MC, Kao RT. Provisional restorations: a key determinant for implant site development. J Calif Dent Assoc. 2008;36(4):261-7.
5 Kaiser DA, Cavazos E Jr. Temporization techniques in fixed prosthodontics. Dent Clin North Am. 1985;29(2):403-12.
6 Burke FJ, Murray MC, Shortall AC. Trends in indirect dentistry: 6. Provisional restorations, more than just a temporary. Dent Update. 2005;32(8):443-4, 447-8, 450-2.
7 Bral M. Periodontal Considerations for Provisional Restorations. Provisional Restorations. Dent Clin North Am. 1989;457-65.
8 Hamza TA, Rosenstiel SF, Elhosary MM, Ibraheem RM. The effect of fiber reinforcement on the fracture toughness and flexural strength of provisional restorative resins. J Prosthet Dent. 2004;91(3):258-64.
9 Donaldson D. Gingival recession associated with temporary crowns. J Periodontol. 1973;44(11):691-6.
10 McDonald TR. Excellence, Precision, Efficiency. The Single Tooth Provisional Restoration. The AGD Explorer.
11 Haselton DR, Diaz-Arnold AM, Vargas MA. Flexural strength of provisional crown and fixed partial denture resins. J Prosthet Dent. 2002;87(2):225-8.
12 Whalen S, Bouschlicher M. Intrapulpal temperature increases with temporary crown and bridge materials. Gen Dent. 2003;51(6):534-7.
13 Michalakis K, Pissiotis A, Hirayama H, Kang K, Kafantaris N. Comparison of temperature increase in the pulp chamber during the polymerization of materials used for the direct fabrication of provisional restorations. J Prosthet Dent. 2006;96(6):418-23.
14 Babcic V, Perry R, Kugel G. Material toughness. AADR Abstract 2008:0371.
15 Schwedhelm ER. Direct technique for the fabrication of acrylic provisional restorations. J Contemp Dent Pract. 2006;7(1):157-73.
16 Ogawa T, et al. Effect of water temperature during polymerization on strength of autopolymerizing resin. J Prosthet Dent. 2000;84:222-4.
17 McDonald TR. Temporization Material Alleviates Many Manipulation and Performance Challenges. Dent Today. 2003;22(3).
18 McDonald TR. Excellence, Precision, Efficiency. The Single Tooth Provisional Restoration. The AGD Explorer.
19 DeLong R. University of Minnesota, MDRCBB. IADR Abstract 2006:0368.
20 Sen D, Göller G, Işsever H. The effect of two polishing pastes on the surface roughness of bis-acryl composite and methacrylate-based resins. J Prosthet Dent. 2002;88(5):527-32.
21 Guler AU, Kurt S, Kulunk T. Effects of various finishing procedures on the staining of provisional restorative materials. J Prosthet Dent. 2005;93(5):453-8.
22 Davidi MP, Beyth N, Weiss EI, Weiss EI, Eilat Y, Feuerstein O, Sterer N. Effect of liquid-polish coating on in vitro biofilm accumulation on provisional restorations: Part 2. Quintessence Int. 2008;39(1):45-9.
23 McDonald TR. Esthetic and Functional Testing with Provisional Restorations. The Art of Articulation. 2004;2(1):1-3.
24 Bohnenkamp DM, Garcia LT. Repair of bis-acryl provisional restorations using flowable composite resin. J Prosthet Dent. 2004;92(5):500-2.
25 Craig & Powers, Restorative Dental Materials, 11th ed. Chapter 20, pg. 594.
26 Lewinstein I, Fuhrer N, Ganor Y. Effect of a fluoride varnish on the margin leakage and retention of luted provisional crowns. J Prosthet Dent. 2003;89(1):70-5.
27 Carvalho CN, de Oliveira Bauer JR, Loguercio AD, Reis A. Effect of ZOE temporary restoration on resin-dentin bond strength using different adhesive strategies. J Esthet Restor Dent. 2007;19(3):144-52; discussion 153.
28 Peutzfeldt A, Asmussen E. Influence of eugenol-containing temporary cement on bonding of self-etching adhesives to dentin. J Adhes Dent. 2006;8(1):31-4.
29 Abo-Hamar SE, Federlin M, Hiller KA, Friedl KH, Schmalz G. Effect of temporary cements on the bond strength of ceramic luted to dentin. Dent Mater. 2005;21(9):794-803.

Author Profile

Thomas R. McDonald, DMD

Dr. Tom McDonald is a graduate of the University of Georgia and the Medical College of Georgia School of Dentistry. He maintains a full time private practice in Athens, Georgia. Since 1983, Dr. McDonald has served on the faculty of the Medical College of Georgia School of Dentistry as Clinical Instructor of Oral Rehabilitation. He is a member of O.K.U., Distinguished Alumnus of the Medical College of Georgia in 1995, Fellow of the American College of Dentists, Fellow of the International College of Dentists, and Honorable Fellow of the Georgia Dental Association. A frequent lecturer in the area of occlusion, restorative dentistry, esthetics, and provisional restorations, Dr. McDonald has presented courses nationally including at the Hinman Dental Meeting, Chicago Midwinter Meeting, California Dental Association Meeting, the American Academy of Operative Dentistry, and the American Dental Association Meeting.

Disclaimer

The author(s) of this course has/have no commercial ties with the sponsors or the providers of the unrestricted educational grant for this course.

Reader Feedback

We encourage your comments on this or any PennWell course. For your convenience, an online feedback form is available at www.ineedce.com.

Acknowledgment

Figures 17-22 courtesy of Dr. Chris Hooper.

Questions

1. More than _____ million crowns and more than _____ fixed partial dentures were estimated to have been placed by private practitioners in 2007.
   a. 15, 5
   b. 25, 5
   c. 25, 10
   d. 35, 10
2. Depending on the complexity of the individual case, temporization may be required short term or as an interim medium-term step.
   a. True
   b. False
3. Temporization materials and techniques require consideration of _____.
   a. esthetics
   b. the complexity of the case
   c. the length of time the provisional restoration is required
   d. all of the above
4. Since the temporary restoration may only be needed short term, it is not essential that it resist occlusal and functional loads.
   a. True
   b. False
5. If the margins of provisional restorations are rough and inaccurate, _____ may occur.
   a. iatrogenic gingival recession
   b. microleakage
   c. patient discomfort
   d. all of the above
6. Custom fabrication is not always necessary for multi-unit fixed provisional restorations.
   a. True
   b. False
7. Custom fabricated provisional restorations can be fabricated from _____ .
   a. methacrylate resins
   b. bisphenol-A-glycidyl methacrylate
   c. bisacrylate composite
   d. all of the above
8. Using fine particle sizes improves the smoothness and ability to polish the cured material for provisional restorations.
   a. True
   b. False
9. _____ have a higher exothermic setting than _____ .
   a. Bis-Acryl materials; methacrylates
   b. Alginates; methacrylates
   c. Methacrylates; bis-Acryl materials
   d. none of the above
10. A high-gloss finish on the temporary restoration _____.
    a. helps prevent the buildup of plaque
    b. helps prevent staining
    c. helps promote gingivitis
    d. a and b
11. Custom-fabricated temporization can involve a direct, indirect or hybrid technique.
    a. True
    b. False
12. An advantage of this indirect technique is the _____ .
    a. reduced chairside time
    b. stone casts that enhance polymerization shrinkage
    c. lack of potential for pulpal damage from exothermic setting of provisional materials
    d. a and c
13. Bis-Acryl materials offer lower polymerization shrinkage than methacrylates do.
    a. True
    b. False
14. The only difference between the hybrid technique and the direct custom fabrication technique is the pre-operative, extra-oral, laboratory fabrication of the matrix.
    a. True
    b. False
15. Currently, the hybrid technique is the best technique for the fabrication of veneer provisional restorations.
    a. True
    b. False
16. A pre-fabricated matrix button _____.
    a. reduces chairside time
    b. removes the need for an additional impression
    c. is a simple method for chairside fabrication of multi-unit provisionals
    d. a and b
17. Thin, soft tin-silver alloy provisionals are intended for use as long-term provisionals.
    a. True
    b. False
18. Prefabricated stainless steel crowns are also available that _____.
    a. are very durable
    b. are pre-trimmed, belled and crimped to save placement time
    c. can be used for long-term cases
    d. all of the above
19. A pre-fabricated composite provisional crown that is malleable and adjustable is available.
    a. True
    b. False
20. There is no potential for pulpal irritation due to exothermic setting if provisional crown resins are cured extra-orally.
    a. True
    b. False
21. The fit and contour of malleable resin provisional crowns is created chairside.
    a. True
    b. False
22. The indirect technique can be used with a diagnostic wax-up.
    a. True
    b. False
23. The ideal temporary cement will _____.
    a. be insoluble when exposed to fluids intra-orally
    b. adhere strongly to the provisional restoration
    c. provide a hermetic seal
    d. all of the above
24. The ideal temporary cement needs to possess caries-preventive benefits only if it is used for the definitive restoration.
    a. True
    b. False
25. With the increased popularity of resin bonding of final restorations, many clinicians are avoiding eugenol-based provisional cements.
    a. True
    b. False
26. Varnishes can be used prior to the application of luting cements to _____.
    a. help provide a seal
    b. reduce adhesion to the preparation when using very strong cements
    c. enhance esthetics
    d. a and b
27. Polycarboxylate cement does not interact with bonding system luting cements or other permanent cements.
    a. True
    b. False
28. Excellent provisional restorations are a minor component for the clinical success of definitive fixed restorations.
    a. True
    b. False
29. _____ can be used as a matrix for the indirect technique.
    a. Stiff silicone putty
    b. VPS material
    c. A vacu-formed matrix
    d. all of the above
30. The reduced air-inhibited layer found with advanced bis-Acryl is easier to remove and results in a smooth rather than sticky feel to the material.
    a. True
    b. False

ANSWER SHEET

Contemporary Temporization

Name: Title: Specialty:

Address: E-mail:

City: State: ZIP: Country:

Telephone: Home ( ) Office ( )

Requirements for successful completion of the course and to obtain dental continuing education credits: 1) Read the entire course. 2) Complete all information above. 3) Complete answer sheets in either pen or pencil. 4) Mark only one answer for each question. 5) A score of 70% on this test will earn you 4 CE credits. 6) Complete the Course Evaluation below. 7) Make check payable to PennWell Corp.

Educational Objectives

1. Know the requirements for successful temporization.
2. Know the techniques available for indirect temporization and the advantages these offer.
3. Know the techniques available for direct temporization and the advantages these offer
4 Know the requirements of temporary cements and considerations required in proper selection.

Course Evaluation

Please evaluate this course by responding to the following statements, using a scale of Excellent = 5 to Poor = 0.

1. Were the individual course objectives met?	Objective #1:	Yes	No	Objective #3:	Yes	No	
	Objective #2:	Yes	No	Objective #4:	Yes	No	
2. To what extent were the course objectives accomplished overall?	5	4	3	2	1	0	
3. Please rate your personal mastery of the course objectives.	5	4	3	2	1	0	
4. How would you rate the objectives and educational methods?	5	4	3	2	1	0	
5. How do you rate the author's grasp of the topic?	5	4	3	2	1	0	
6. Please rate the instructor's effectiveness.	5	4	3	2	1	0	
7. Was the overall administration of the course effective?	5	4	3	2	1	0	
8. Do you feel that the references were adequate?		Yes		No			
9. Would you participate in a similar program on a different topic?		Yes		No			
10. Would you like to receive promotional offers from the sponsor of this course?		Yes		No			

11. If any of the continuing education questions were unclear or ambiguous, please list them.

_____

12. Was there any subject matter you found confusing? Please describe.

_____

_____

13. What additional continuing dental education topics would you like to see?

_____

_____

Mail completed answer sheet to

Academy of Dental Therapeutics and Stomatology,
A Division of PennWell Corp.
P.O. Box 116, Chesterland, OH 44026
or fax to: (440) 845-3447

For IMMEDIATE results,
go to www.ineedce.com to take tests online.
Answer sheets can be faxed with credit card payment to
(440) 845-3447, (216) 398-7922, or (216) 255-6619.

☐ Payment of $59.00 is enclosed.
(Checks and credit cards are accepted.)

If paying by credit card, please complete the following: ☐ MC ☐ Visa ☐ AmEx ☐ Discover

Acct. Number: _____

Exp. Date: _____

Charges on your statement will show up as PennWell

1.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	16.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
2.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	17.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
3.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	18.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
4.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	19.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
5.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	20.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
6.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	21.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
7.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	22.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
8.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	23.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
9.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	24.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
10.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	25.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
11.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	26.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
12.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	27.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
13.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	28.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
14.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	29.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
15.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	30.	Ⓐ	Ⓑ	Ⓒ	Ⓓ

AGD Code 017, 250, 610

PLEASE PHOTOCOPY ANSWER SHEET FOR ADDITIONAL PARTICIPANTS.

CONT0907DE